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EMPLOYMENT IN EUROPEAN HIGH TECH MANUFACTURING SMES DURING THE RECOVERY (2009-2011)

EL EMPLEO EN LAS EMPRESAS MANUFACTURERAS DE ALTA TECNOLOGÍA EN LAS PYMES DURANTE LA RECUPERACIÓN (2009-2011)

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ABSTRACT

The industrial policy debate in the EU is mostly centred on the importance of high-tech manufacturing in the recovery from the 2008/2009 crisis and for the future prosperity of Europe. This paper looks at employment in European high-tech manufacturing Small and Medium sized Enterprises (SMEs) during the recovery from the global financial and economic crisis: 2009 - 2011. Its aim is to study the relations between employment in said sector and macroeconomic policy and structural factors. A simple regression is used to ascertain the influence of these factors on employment in high-tech manufacturing SMEs. Policy implications are also drawn.

Key words: Small and Medium Sized Enterprises, European High-tech SMEs, Employment Growth, Recovery, Crisis. **JEL**: J21, J08.

RESUMEN

El debate sobre la política industrial en la UE está fundamentalmente centrado en la importancia que deben tener los sectores manufactureros de alta tecnología en la recuperación de la crisis del 2008/2009 y para la prosperidad futura en Europa. Este artículo analiza el empleo en pequeñas y medianas empresas (SME en sus siglas en inglés) europeas que trabajan en sectores de alta y media tecnología y se centra en el periodo de recuperación de la crisis global y financiera del 2009-2011. El objetivo es estudiar las relaciones entre el empleo en dicho sector y la política macroeconómica y los factores estructurales. Se hace uso de una regresión simple para comprobar la influencia de dichos factores sobre el empleo en SME en sectores de alta tecnología. A partir de este análisis se extraen recomendaciones en materia de política económica.

Palabras claves: Pequeña y mediana empresa, Manufacturas de alta tecnología, Crecimiento del empleo, Recuperación económica, Crisis. **JEL**: J21, J08.

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1. INTRODUCTION

The manufacturing sector is undergoing a relative decline compared to the services sectors in terms of both value added produced and employment. This is a long-term and on-going phenomenon that has been well documented (Pasinetti, 1981). The global and economic crisis that hit the western world in 2008 has perhaps increased further the pace of this trend. Nonetheless, the significance of manufacturing has been constantly highlighted in the public debate especially in relation to the importance of maintaining a production base which is increasingly complementary to the growth in services. Perhaps more strategic is the partaking in the global value chain with a high-value added industry and the innovation potential linked especially to high-tech manufacturing[1].

The European Competitiveness Report (EC, 2013) is promoting further the strategic importance of the manufacturing sector on the basis of the arguments relating to the manufacturing-services complementarities and the strategic participation in the global value chain. It highlights that the European economy still has competitive advantages in most manufacturing sectors including the high-tech sectors. These sectors, such as pharmaceuticals ICT, electronics and instruments, are either explicitly or implicitly relied upon for job creation given their higher-than-average productivity growth associated to their higher R&D intensity (Nordhaus, 2005; Bogliacino, *et al*. 2012).

The importance of the European manufacturing sector in term of employment can be appreciated by the fact that during the period 2008-2011 the manufacturing sector employed 30.9 million people on average, the share of employment of manufacturing SMEs consisted in about 60% of the total. In the same period, manufacturing SMEs employed on average 18.5 million people. Between 2008 and 2011, the high-tech manufacturing employed, on average, 1.7 million people. Of these, circa 38% were employed in firms with less than 250 employees.

Policy indications refer to general industrial policies based on framework conditions, science policy, R&D and innovation expenditure and Human Resources in Science and technology (HRST). While these indications are usually consistent in their aim of directing the economy towards a path of higher value added productions, productivity growth and "better" employment, very often policy indications do not “disentangle” the complex web of relations between macroeconomic factors such as demand[2] and investments, labour market regulation and the availability of financial resources economy-wide and other structural aspects of the innovation policy toolbox. These factors, as well as their interactions, play an important role in establishing the pre-conditions for the domains discussed in the industrial policy and constitute the basis of the discussion undertaken in this work. Here we re-introduce through a simple regression exercise the issues of investments, labour market regulation and the availability of financial resources economy-wide together with HRST, in the attempt to explain employment growth in European high-tech manufacturing SMEs during the years following the 2008 financial and economic crisis that affected the western world.

[1] High-tech sectors are defined according to the ratio of R&D expenditures over value added. The classification of high tech manufacturing includes manufacture of basic pharmaceutical products and pharmaceutical preparations, manufacture of computer, electronic and optical products and aerospace (a subsection of "manufacture of transport equipment"). For the purpose of this paper the aerospace sector is excluded.

[2] For the aspects regarding the links between demand and innovation in productivity growth we remand to Mowery and Rosenberg (1979) and for a more recent take on the argument: Crespi and Pianta (2008) and Guerzoni (2010). For the issues relating to demand and innovation policy we remand the reader to the work of Edler and Georghiou (2007) and Edler and Uyarra (2013).

The paper is organised as follows. The next section presents a concise review of the literature on employment growth highlighting the causal relationships between factors affecting employment by high-tech manufacturing SMEs. Section 3 presents the empirical evidence on the employment in high-tech manufacturing SMEs in Europe with particular regard to the years subsequent to the 2008 financial and economic crisis. Therein is also described the dataset used, the exercise performed and the results. Section 4 presents a discussion of the findings, policy implications and the limits of our study with a plan for further research.

2. EVIDENCE FROM THE LITERATURE

The importance of employment growth in high-tech manufacturing sectors is often related to the discourse on technological development and its effects on employment. The study and the implications of the links between technological development and employment have been at the centre of an animated debate. Its rationale can be traced back to the works of Hicks (1932), Harrod (1939) and Samuelson (1965). The stylised explanation suggests that firms, in the search for higher profits, tend to reduce the intensity of the least productive factor of production in favour of the most productive. In other words, firms can either introduce more capital intensive innovations that reduce relative employment, or they can introduce innovations that raise the (marginal) productivity of labour and diminish the incentives to invest in capital. Technological advance tends to favour investments in capital with higher technological content and therefore increase unemployment .

Only more recently the hypothesis that investment in technological capital can also increase employment emerged and new theories, developed mostly following empirical evidence of this phenomenon, show that, whilst the process described above might hold true in some cases at a firm-level and in traditional sectors driven by process innovation, in high-tech sectors - characterised by high level of technological capital and product innovation - employment may actually grow as a consequence of new investments. (Smolny, 1998; Greenan and Guellec, 2000; Antonucci and Pianta, 2002 and Pianta, 2005; for a concise presentation of the issues and rationales see Tether *et al*., 2005, especially pages 26 and ss.) .

A further point highlighted by newer studies is the fact that technological change not only shapes employment in terms of number of person employed but also in terms of the "quality" of the employment, in other words, countries with higher education levels experienced faster value-added and employment growth in schooling-intensive industries in the 1980s and 1990s. One of the first formulations of the complementarity between skilled labour and capital investments was made by Griliches, 1970; see also Ciccone and Papaioannou, 2009 and Mastrostefano and Pianta, 2009. This view is also confirmed by Hanusheck and Woessmann (2012) who highlighted how cognitive skills are one of the main determinants of economic growth at a national level. In this respect, the broader domain of intangible capital assumes an important role in determining economic growth both in the traditional economic terms, considering investments in research, development and innovation and expenditure in education, as well as within a wider framework which considers intangible capital, including intellectual capital, as a source of growth and development, (López Ruiz *et al*. 2011).

In relation to growth and employment, great emphasis has been historically given to the capacity of large firms to affect employment in a significant way whilst, before the study made by Birch (1979), the role of SMEs in employment growth has been considered marginal at best. Birch (1979) examined the activities of about 12 million US businesses over a period of 17 year and found that, of the total increase in US employment, 66% was due to

employment growth in firms with fewer than 20 employees. The firms that contributed more to the employment growth were innovative firms. Moreover, Birch found that SMEs created better employment possibilities where public support was available in the form of tax incentives, favourable regulation or employment support programmes. Birch's findings were also confirmed, albeit estimates of SMEs job creation were downwardly adjusted, in the decades that followed his study (Stangler, 2009; Neumark, *et al*. 2011 and Haltiwanger *et al*. 2013).

The empirical and theoretical literature recognise the key role of technology intensive SMEs both as "exploiter" and as "generator" of new technologies. In OECD countries the production patterns in manufacturing strongly point to the growing importance of high-technology manufacturing (Pilat *et al*. 2006). The rationale behind this key role is that, in technology intensive SMEs, investment on "embodied technological capital" and other R&D activities tends to increase SME capacity to absorb knowledge created outside the firm. Consequently, higher levels of investment by SMEs correspond to a higher likelihood that SMEs can benefit from the external environment and eventually grow (Maçãs Nunes *et al*. 2012). On the other hand, and given the generalised low level of R&D investment by SMEs, absorptive capacity is far more important for SME growth. The literature seems concordant with the proposition that absorptive capacity has a relevant impact on the ability of firms to grow by establishing collaborations with external organisations (Hoffman *et al*., 1998; Muscio, 2007; de Jong and Freel, 2010; Maçãs Nunes *et al*. 2012)

This process however is not unidirectional. Large enterprises increasingly look for external sourcing of high-technology and technology intensive SMEs become the natural point of reference they aim to access (Baumol, 2002). This in turn implies that spillover effects occur not only between different industries but also between firms of different size (Peneder, 2003).

Finally, in the policy landscape, the growth of the manufacturing sector, especially high-tech manufacturing SMEs, is at the centre of the policy agenda. There is a generalised consensus that whilst a number of measures have been implemented – at a European level and nation-wide - to foster the creation of new high tech firms, these instruments tend not to deal with the phase of firm development, namely, support the capacity of technology intensive newly born firms or help high-tech manufacturing SMEs to grow larger (Veugelers 2008). Moreover, some "more systemic aspects" of the policy domain have been somehow overlooked, especially in the wake of the 2008 financial and economic crisis. Filippetti and Archibugi (2011) and Makkonen (2013) highlight such points. In particular the first paper refers to those structural elements of the National Innovation System, namely, the competences and quality of human resources, the presence of a strong high–tech sector, the interaction between investments and availability of financing resources. In the time of crisis, a strong innovation system can in fact constitute an effective buffer against the ill effects of the downward trend initiated by external shocks. These observations are also mirrored by Makkonen (2013) with reference to governments' support to science and technology showing how, the recovery may prove more difficult in those countries where science and technology budget adjustments were pro-cyclical. With particular regard to the links between human capital formation and science and technology, Jones and Grimhsaw (2011), highlight how the policy domain has scope to leverage its position in enhancing medium and high levels skills though training which may prove beneficial to the innovation process especially in a period of fast industrial transformation.

3. EMPIRICAL EVIDENCE

3.1 Dataset and variables

Our dataset comprises two main blocks of variables; the first block – the dependent variable – was built by collecting and collating employment data on SMEs operating in the high-tech manufacturing sectors in 25 European Member States: Croatia, Greece and Slovakia have been excluded due to problems encountered during the phases of collation of the relevant information. The dataset therefore includes employment data on Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia and the United Kingdom.

The definition of the high-tech sectors in which SMEs operate has been drawn from the NACE Rev. 2 statistical classification guidelines (Eurostat, 2008), in which Division 21 and Division 26 of the manufacturing sector have been identified as high-tech activities and comprise the sector "Manufacture of basic pharmaceutical products and pharmaceutical preparations" (Division 21) and "Manufacture of computer, electronic and optical products" (Division 26) at a 2-digit level of disaggregation. "Employment" consists of the headcount of people employed in the businesses. Employment in these two sectors has been aggregated to indicate the variable: employment in high-tech manufacturing. Employment data on the two divisions of Group C (Manufacturing) have been computed by summing up employment headcount figures for each year under consideration and the indicator used in this exercise has been calculated as reported in Annex.

SMEs are defined according to the EU recommendation 2003/361 and the size-classes employed in this exercise follow the definitions employed by the EUROSTAT Structural Business Statistics database: SMEs are those companies employing between 0 and 250 people.

The second block – explanatory variables - is based on variables of economic activities available on EUROSTAT. These include government expenditure on labour market policies, gross fixed capital formation, investments in information and communication technologies and human resources in science and technology. Data were collected, according to availability, for the period 2005-2011 for the same group of 25 countries. These variables form the basis of the indicators used in the next stage. Government expenditure in labour market policies, investments in gross fixed capital formation and ICT investments are the result of year-to-year investment decisions (public and private), therefore, given that we are looking at the period of recovery following the 2008 financial and economic crisis, the indicators of policies and investments used in this exercise have been calculated as change from before (2005-2008) to after the crisis (2009-2011) in order to capture the evolution of policy intervention and the behaviour of investors in response to the effect of the crisis .

The indicators regarding net lending reflects the change in conditions of resources availability. The indicator used in the regression has been calculated to summarise the trend in available resources in the recovery period 2009-2011.

Human resources in science and technology are the result of longer term dynamics originating in the past. The indicators used in the exercise summarise the trends in scientists and engineers available in the EU Member States, as a percentage of the population during the recovery period only.

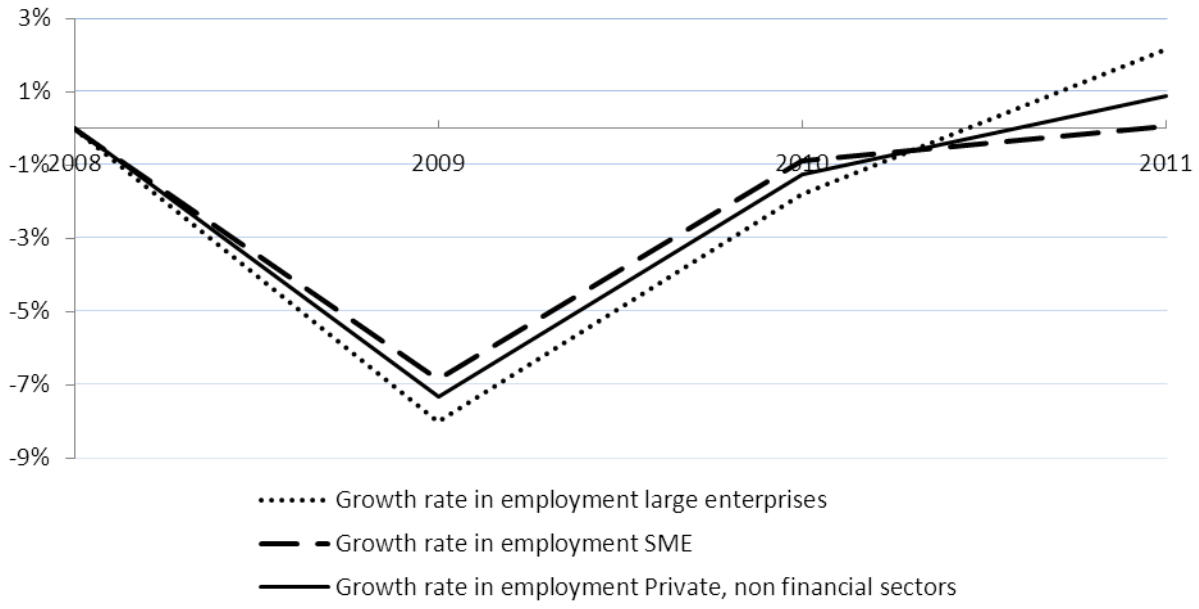
Research and innovation indicators (R&D and innovation expenditure) have been excluded from this exercise. Details of the data source, indicators and methods of computing them are reported in annex.

3.2 Employment growth in European high-tech SMEs

Employment in the manufacturing sector and in high-Tech SMEs during the years 2008-2001.

The dynamics described in Figure 1 shows that during the height of the crisis, namely 2008 and 2009, the decline in Employment by manufacturing SMEs has been less severe than that of large manufacturing firms. However, in 2010 and 2011 larger manufacturing firms grew faster than manufacturing SMEs.

FIGURE 1. GROWTH RATE IN EMPLOYMENT 2008-2011

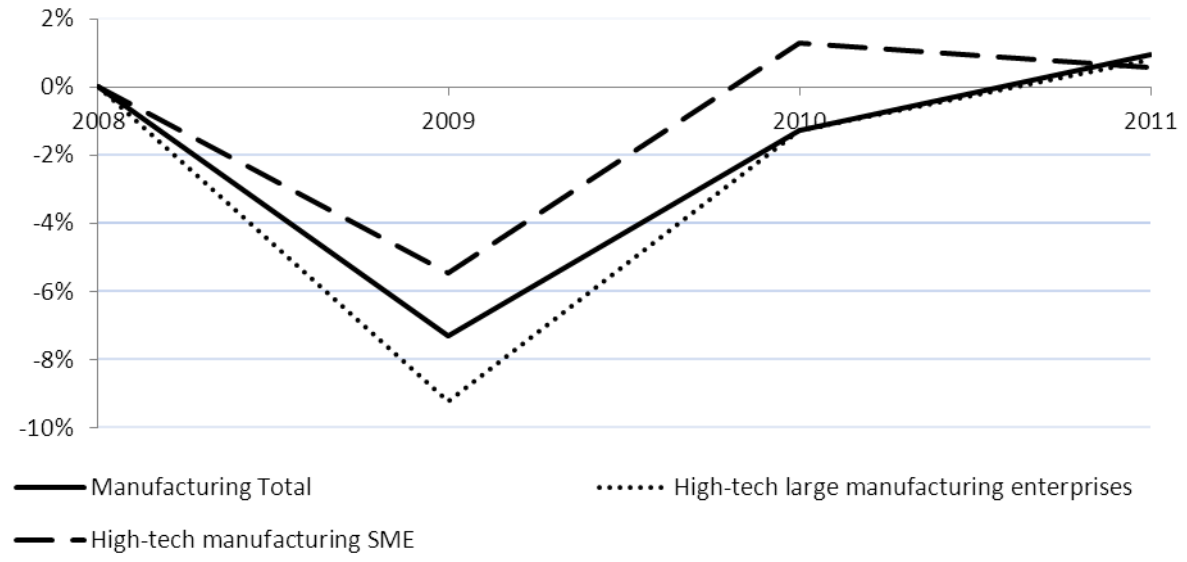


Source: own calculations, Eurostat-SBS data

Within this scenario, the high-tech manufacturing SMEs lost 5.4% of its employment in 2008 corresponding to some 19,000 jobs, against a job loss of over 9% of large manufacturing enterprise corresponding to 125,000 jobs (Figure 2).

The model adopted in this work is a simple cross-section OLS regression whereby the dependent variable is 1) change in employment of high-tech manufacturing SMEs over the period 2009-2011, and the explanatory variables are: 2) high-tech manufacturing SMEs demand (proxied by gross value added) 3) government expenditure on labour market policies - difference in growth rate 2005-2008 versus 2009-2011; 4) gross fixed capital formation-difference in growth rate 2005-2008 versus 2009-2011; 5) investments in information and communication technologies - difference in growth rate 2006-2008 versus 2009-2011; 6) net lending – change in 2009-2011; 7) human resources in science and technology (Scientists and Engineers) – change in 2009-2011 and 8) human resources in science and technology Scientists and engineers of 25 – 34 years of age) – change in 2009-2011.

FIGURE 2. GROWTH RATE IN EMPLOYMENT – MANUFACTURING (2008-2011)



Source: own calculations, Eurostat-SBS data

The inspection of the correlation table evidences that change in high-tech SMEs during the recovery period is highly correlated with the change in demand for the goods produced (change in value added by high-tech manufacturing SMEs). Change in employment is also highly correlated with public expenditure on labour market policy, investments in gross fixed capital formation and the percentage of scientists and engineers in the population.

There is some mild correlation amongst the variables, especially between gross fixed capital formation and investments in ICT as both variables refer to the investment behaviour within the economy, for this reason collinearity diagnostics was performed. The eigenvalues of the regressions are substantially different from zero and the Variance Inflation Factors (VIF) calculated for the models are below the recommended threshold (VIF > 3), therefore collinearity can be excluded.

The two regressions fit the data quite adequately as shown by a high and statistically significant F-statistic in both cases and explain circa 67% of the variance in the first case (Adjusted R-squared = 0.673) and over 70% of the variance in the second (Adjusted R-squared = 0.742) .

In both models the main employment growth factor is constituted by demand. The standardised coefficient in both models is above 0.4, this is not surprising as demand-driven employment growth has been recognised and studied since Ricardo (1821). The un-standardised coefficients show that, all else being constant, for a 1% increase in demand (value added) employment in high-tech SMEs increases by more that 0.18% .

Investments in fixed capital formation and ICT have a positive effect on employment in high-tech manufacturing SMEs as expressed by the sign of the coefficients; the combined weight of their un-standardised coefficients in the regression is such that a 1% increase in investments (skewed toward capital with high-technological content – i.e. ICT) leads to some 0.30% of employment growth .

Change in the availability of financial resources also has a limited positive connection with employment in high tech manufacturing SMEs. The coefficient is however non

significant with a p-value of less than 0.1 (P-value = 0.056 in the first specification and 0.078 in the second).

TABLE 1: PEARSON'S CORRELATIONS AMONGST VARIABLES AND VARIANCE INFLATION FACTORS, DEPENDENT VARIABLE: CHANGE IN EMPLOYMENT OF HIGH-TECH MANUFACTURING SMES (2009-2011)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	VIF Mod1	VIF Mod2
(1) Dependent variable: Change in employment of high-tech manufacturing SME (2009-2011)	1.000									
(2) Value added growth of high-tech man. SMEs (2009-2011)	0.746	1.000							1.617	1.545
(3) Public expenditure on labour market policy (1-9) 2005/08 to 2009/11	0.546	0.402	1.000						2.357	2.270
(4) Percentage change in gross fixed capital formation average 2005/08 to 2009/11	0.551	0.452	0.690	1.000					2.261	2.305
(5) ICT investment 2006/08 to 2009/10	0.065	0.095	-0.304	-0.313	1.000				1.294	1.316
(6) Change in net lending (net borrowing) 2009-2011	0.107	-0.012	-0.387	-0.326	0.035	1.000			1.354	1.395
(7) Scientists and Engineers as a percentage of the population 2009-2011	0.483	0.361	0.306	0.184	-0.117	0.145	1.000	___	1.305	--
(8) Scientists and engineers (age 25-34) as a percentage of the population 2009-2011	0.426	0.188	-0.015	-0.138	0.193	___	0.296	1.000	--	1.230

Source: The authors

TABLE 2: CROSS SECTION REGRESSION, DEPENDENT VARIABLE: CHANGE IN EMPLOYMENT OF HIGH-TECH MANUFACTURING SMES (2009-2011)

Dependent variable: Change in employment of high-tech manufacturing SME (2009-2011)	Constant	Value added growth of high-tech man. SMEs (2009-2011)	Public expenditure on labour market policy (1-9) 2005/08 to 2009/11	Percentage change in gross fixed capital formation average 2005/08 to 2009/11	ICT investment 2006/08 to 2009/10	Change in net lending (net borrowing) 2009-2011	Scientists and Engineers as a percentage of the population 2009-2011	Scientists and engineers (age 25-34) as a percentage of the population 2009-2011
Coefficient	-0.038	0.188	0.049	0.005	0.271	0.008	0.058	
(st. Error)	(0.18)	(0.70)	(0.029)	(0.003)	(0.172)	(0.004)	(0.048)	
Standardised coefficient		0.415	0.314	0.280	0.218	0.292	0.169	
t – stat [(a)]		2.6745**	1.679	1.526	1.575	2.059*	1.210	
R ^2 =0.762; Adj. R^2 = 0.673; F [(a)] = 8.542* **								
Coefficient	-0.045	0.185	0.047	0.006	0.191	0.006		0.097
(st. Error)	(-0.015)	(0.061)	(0.026)	(0.003)	(0.154)	(0.003)		(0.039)
Standardised coefficient		0.409	0.301	0.327	0.154	0.241		0.297
t – stat [(a)]		3.042***	1.843*	1.987*	1.240	1.882*		2.477**
R ^2 = 0.812; Adj. R^2 = 0.742; F [(a)] = 11.539* **								

Note: (a): ***=sig.<0.01; ** = sig. < 0.05; * = sig. < 0.10

Source: The authors

The coefficients of public expenditure on labour market policies (LMP) have a much lower connection with employment growth than demand; however, its impact is positive even if not statistically significant (with a p-value of 0.113 in the first model and 0.084 in the second model). The sign of this coefficient is in line with Birch's conclusion that public intervention on the labour market has positive effects on SMEs employment (Birch, 1979). Moreover, disaggregating the expenditure on labour market accordingly to the objectives of the policies, one can see that objectives such as LMP services (services and activities of the public employment services together with any other publicly funded services for jobseekers) and LMP support (including financial assistance to compensate individuals for loss of wage or salary, support during job-search and early retirement) show higher correlation with employment growth than LMP measures which include temporary interventions in support of disadvantaged in the labour market, measures aiming at activating the unemployed, helping people move from involuntary inactivity into employment, or maintaining the jobs of people threatened by unemployment (table 3).

TABLE 3. PAIRED CORRELATION: CHANGE IN EMPLOYMENT OF HIGH-TECH MANUFACTURING SMES (2009-2011) AND PUBLIC EXPENDITURE ON LABOUR MARKET POLICY (BY OBJECTIVE)

	Public expenditure on labour market policy (1-9) 2005/08 to 2009/11	Public expenditure on labour market policy (Services) 2005/08 to 2009/11	Public expenditure on labour market policy (Measures) 2005/08 to 2009/11	Public expenditure on labour market policy (Support) 2005/08 to 2009/11
Change in employment of high-tech manufacturing SME (2009-2011)	0.532**	0.404*	0.131	0.543**

Note: ** = sig. < 0.05; * = sig. < 0.10

Source: own calculations, Eurostat-SBS data

Finally, positive changes in the availability of scientists and engineers correspond to increase in employment in high-tech manufacturing SMEs. The un-standardised coefficient points towards a 0.5% increase in high-tech SME employment for each 1% increase in the supply of scientists and engineers. This effect is however not significant as the p-value of the coefficient is 0.3. However, the sign of the coefficient are in agreement with the research conducted by Jones and Grimshaw (2009) and Makkonen (2013). Interestingly though is the case of young scientists and engineers (age within 25 – 34). The regression coefficient is higher and statistically significant at the 5% level. It indicates that a 1% increase of scientists and engineers in the general population correspond a 0.10% increase in employment in high-tech SMEs (p-value = 0.025). This result confirms the studies of Belfield (1999) and Moy and Lee (2002) highlighting how younger graduates prefer employment in large companies which may offer higher wages and advantageous career paths relative to SMEs and reversing to employment in high-tech manufacturing SMEs as first step in their career or as a second choice.

Discussion of the findings and policy implications

Despite the limitations due to data availability and the simplicity of the exercise conducted, it emerges that growth of employment in high-tech manufacturing SMEs is of course linked to the demand for products but it is also linked to investments in gross fixed capital formation and investment in ICT. The complementarity between technological capital and labour in this sector points towards the presence of avenues of recovery allowing for the exploration of productivity gain and sectoral growth without necessarily compromising on employment growth. These aspects are extremely important especially with regards to the effect of the 2008 crisis and in relation to the strategy for recovery from the sharp decline in value added and employment.

Therefore, the policy domains taken under consideration here involve labour market, financial and HRST policies and our findings suggest that in these areas particular attention should be places on the role of policy. In all policy domains identified, whilst it is straightforward to recommend to increase access to financing, invest in science, technology and innovation and correct labour market failures, it becomes more difficult, especially in this period of depleted public coffers, to think of effective policy interventions which focus on the problems at hand and are not taxing on the pubic budget.

In this perspective, perhaps it will be easier to think of access to finance, and public/private co-financing of promising (yet risky) ventures in high tech manufacturing once the turmoil in the financial markets subsides with more carefully planned regulations and the dissipation of policy uncertainty.

It may also be the case that strategic interventions on the labour market might leverage the various national networks of public employment services offices and the resources devolved to LMP support policy in order increase effectiveness in reducing the miss-match between demand and supply of skilled labour in high tech industries.

Finally, while it has been demonstrated over and over that science and technology investments are paramount to strengthening the national innovation and pave the way for a high value added growth/recovery (yet, in many EU Member States the financing of S&T budget is still pro-cyclical) some measures might be implemented to exploit further the potential of national human resources in science and technology. Introducing business and entrepreneurship training in scientific tertiary education or tax rebates on the employment of science graduate (similar to tax incentives on R&D investments) might constitute a solution in the time of crisis.

Limits of the study and further research

Our contribution aims at exploring the dynamics of employment in European high-tech manufacturing SMEs during the recovery from the 2008 financial and economic crisis using the rather simplistic approach of regressing general trends of labour policy interventions, investments in gross fixed capital and ICT, net lending and HRST variables on sectoral SMEs employment. Smaller businesses constitute the largest share of the structure of business activities in the EU and the high-tech manufacturing is an important component of the industrial base; the links between employment and research and innovation need further and more indepth enquiry. More substantial research work is necessary to fully understand the phenomenon and be able to draw more general theoretical insight and refine the policy implications. In particular, the level of analysis needs to step up from exploration of the trends to larger scale national and sectoral enquiries drawing insight from panel analysis. Eventually it is envisaged that the approach will proceed towards the study of this phenomenon in more interesting productive enclaves such as regional dynamics, agglomerations, milieus, districts or networks of enterprises. This would certainly enrich our knowledge and understanding of the employment dynamics of high-tech manufacturing SMEs and re-connect this line of enquiry with other important determinants of firms' growth especially in the area of Science, Technology and Innovation.

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